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Incidence of metopism in dried skulls of adults from the osteological collection of the faculty of medicine of FAP-Araripina (PE)

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ABSTRACT
During fetal life and childhood, the bones of the skull and face are separated by dense connective tissue membranes with large amounts of collagen fibers that constitute the sutures. One of these is the metopic suture, which joins the two frontal bones in the embryonic period and in the newborn. This suture appears approximately at the end of the second month of intrauterine life between the two ossification centers of the frontal bone, being considered as an anterior extension of the sagittal suture and its total fusion can occur from the end of the first year to the eighth or tenth year of life. , and may persist in adults. The objective of our study was to verify the incidence of metopic suture in dry skulls of adults in the Northeast region of Brazil. A sample of 474 dry skulls of adults, 294 male and 180 female, belonging to the Forensic Anthropology Center of the Faculty of Medicine of FAP-Araripina was used. In general, 84.6% of the skulls did not have a persistent metopic suture, with 3.6% having a complete metopic suture, 10.3% an incomplete metopic suture of the nasion type and 1.5% an incomplete metopic suture of the nasion type. bregma type. Complete metopic suture was more frequent in males (2.3%) than in females (1.3%). Due to the large territorial extension of Brazil and the great miscegenation of the population, in our view, it is necessary to carry out more studies in Brazilian individuals through dry skulls or images, especially if carried out in different regions of our country.

Keywords: Incidence, Metopism, Dry skulls.

1 INTRODUCTION

During fetal life and in infancy, the bones of the skull and face are separated by membranes of dense connective tissue with a large amount of collagen fibers that constitute the sutures (MOORE; PERSAUD, 2002; GENESER, 2007). This tissue will allow these bones to follow the growth of the

brain during intrauterine life, as well as in the first years of life, and the maintenance of these bones during childhood is a precondition for the continued growth of the vault bones and as an indirect factor of normal skull growth (WATZEK et al., 1982). Eventually, over the years, these sutures fuse together, forming a synostosis between the bones of the skull and face. One of them is the metopic suture, which joins the two frontal bones in the embryonic period and in the newborn**.** This suture appears approximately at the end of the second month of intrauterine life between the two ossification centers of the frontal bone, and is considered an anterior extension of the sagittal suture, and its total fusion can occur from the end of the first year to the eighth or tenth year of life (ROA; MORAGA; CANTIN, 2011; KIMAPORN et al., 2015). It has been reported that in some cases this suture can persist into adulthood, closing much later than the rest of the other sutures, even in very old people. The condition in which the metopic suture persists completely in the adult is called metopism (NAKATANI; TANAKA; MIZUKAMI, 1998; MADEIRA, 1995). Metopism can be related to various causes, such as abnormal growth of cranial bones, pathological metopism triggered by hydrocephalus, growth arrest, heterospecific factors, sexual influence, heredity, atavism, stenocrotaphy, plagiocephaly, scaphocephaly, mechanical causes, hormonal dysfunction, and genetic influence (DEL SOL et al., 1989; CASTILHO; ODA; SANTÁNA, 2006). Different classifications according to layout and shape were described, thus allowing complete and incomplete metopic sutures. Complete suture extends from the nasion to the bregma uninterruptedly, and incomplete when it extends from the nasion or bregma to several points of the frontal bone, and is classified into two subtypes: incomplete metopic suture "bregma" and incomplete metopic suture "nasium" (ROA; MORAGA; CANTIN, 2011; KIMAPORN et al., 2015). Regarding the frequency of metopism, it is known that ethnic diversity plays an important role in the different incidences of metopism, and it is reported that this situation varies from 0.8% to 15% in different populations (NIKOLOVA; TONEVA, 2012). Clinically, persistent metopic suturing can confuse radiologists and neurosurgeons when reading X-rays, CT scans, or MRI scans in misdiagnoses in emergency situations (KIMAPORN et al., 2015). Bearing in mind the importance of persistent metopic suture and its variations in different population groups, the present study reports the incidence of metopism in dry skulls of adults belonging to individuals from the Northeast region of Brazil.

2 MATERIAL AND METHOD

For our study, 474 dried skulls of adults were used, 180 females and 294 males. The sample was between 20 and 95 years old, all from the Northeast Region of Brazil, especially from the State of Sergipe. These skulls had a known sex and age with absolute certainty and were obtained in accordance with law No. 8501 of 1992, which deals with the use of unclaimed corpses for the purpose of studies and research. All the skulls belong to the collection of the Center for Forensic Anthropology of the

Faculty of Medicine of FAP-Araripina, located in the State of Pernambuco, Brazil. Our Osteological Collection is composed of 500 skeletons cataloged by sex and age and is registered on the website of the *Forensic Anthropology Society of Europe* (FASE). The inclusion criterion for this study was to select these skulls with intact and pathologies involved. For data collection, the inductive approach method was used with a systematic and direct observation technique for data collection (cranioscopy) in frontal norm and a descriptive procedure for data analysis. The observations were made by two researchers duly calibrated in relation to the theme.

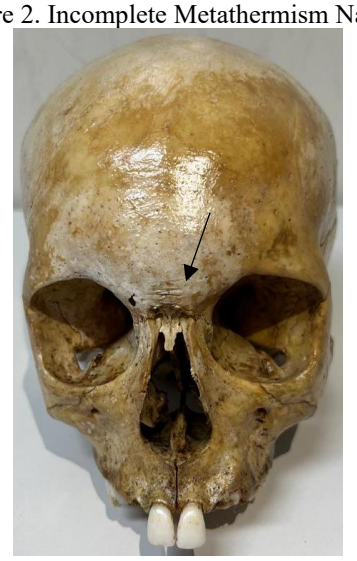
3 RESULTS AND DISCUSSION

At the end of the observations and after cataloguing all the data, we verified the presence of the two types of metopism in our study: complete (Figure 1) and incomplete, nasion type (Figure 2) and bregma type (Figures 3 and 4).

Figure 1. Full mettopism

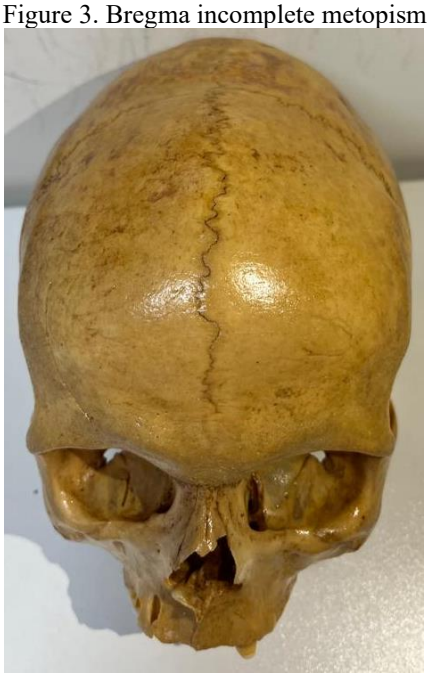
Source: personal collection

Figure 2. Incomplete Metathermism Nasion



Source: personal collection

Figure 3. Bregma incomplete metopism



Source: personal collection

Figure 4. Bregma incomplete metopism

Source: personal collection

According to data collection, we obtained the following results. In general, including the 474 skulls, the metopic suture was absent in 401 (SMA), representing 84.6% of the cases. Complete metopic suture (CMS) was found in 17 skulls (3.6%). Regarding incomplete nasium-type metopic sutures (INMS), they were found in 49 skulls (10.3%) and incomplete bregma-type sutures (IBMS) appeared in 7 skulls, with a percentage of 1.5% of the skulls examined (Table 1).

Table 1 – Quantity of the total number of skulls evaluated and the percentages of absent (SMA), complete (SMC) and incomplete nasium-type (SMIN) and bregma-type (SMIB) metopic sutures

Grand total	SMA (absent)	SMC	SMIN	SMIB
474	401 (84,6%)	17 (3,6%)	49 (10,3%)	7 (1,5%)

Source: prepared by the authors.

Using the male sample (n=294), we found the following results. In 245 skulls, there was no presence of a complete or incomplete metopic suture, representing 51.7% of the cases. In 11 skulls (2.3%) the metopic suture appeared in its complete mode. Regarding incomplete metopic sutures of the nasian type, we found 35 cases (7.4%) and incomplete bregma was found in 3 skulls, representing 0.6% of the cases (Table 2).

Table 2 – Quantity of total male skulls and percentages of absent (SMA), complete (SMC) and incomplete nasion-type (SMIN) and bregma-type (SMIB) metopic sutures

Total male sex	SMA (absent)	SMC	SMIN	SMIB
294	245 (51,7%)	11 (2,3%)	35 (7,4%)	3 (0,6%)

Source: authors' elaboration

Regarding the female gender, of the 180 skulls, the metopic suture was absent in 156, representing 32.9% of the cases. A total of 6 skulls were found with complete sutures in 1.3% of the cases. Incomplete nasion sutures were found in 14 skulls (3.0%) and incomplete bregma sutures were found in 4, representing 0.8% of the cases (Table 3).

Table 3 – Quantity of total female skulls and percentages of absent (SMA), complete (SMC) and incomplete nasion-type (SMIN) and bregma-type (SMIB) metopic sutures

Total female sex	SMA (absent)	SMC	SMIN	SMIB
180	156 (32,9%)	6 (1,3%)	14 (3,0%)	4 (0,8%)

Source: authors' elaboration

A comparison between males and females showed that the percentage of cases with absence of metopic suture was higher in males than in females. Complete metopic suture was more frequent in males (2.3%) than in females (1.3%). Nasion-type metopic suture was also more frequent in males than in females, with 7.4% and 3.0%, respectively. On the other hand, metopic bregma sutures were more frequent in females, with 0.8% of cases versus 0.6% in males, with a slight difference.

During the last few years, some studies have been carried out on the subject, in national samples and in foreign populations. In a study conducted in the 1980s, Del Sol et al. (1989) examined a sample of 400 dried skulls of Brazilian adults, finding that in 2.75% of the cases the complete metopic suture was found, while the incomplete suture appeared in 28.75% of the skulls examined. Another study

using a sample of Brazilian individuals was carried out by Castilho, Oda and Santána (2006), in which the authors used 71 skulls of adults, of which 7.04% had complete metopic sutures while 32.39% had incomplete sutures, the latter being more frequent in women (60.86%) than in men (31.13%). In our study, incomplete sutures appeared more frequently in males, a result that differs from the present study. In another more recent study, da Silva et al. (2013), in a sample of 134 dried adult skulls, found complete metopic suture in 4.48% of cases, while incomplete suture appeared in 5.22% of the skulls examined. Comparing these three studies, we found that the incidence of complete metopic suture was below 8% of the cases. Regarding incomplete sutures, the incidence was higher, with 28 and 32.39% in the first two studies, respectively, which did not occur in the study by da Silva et al. (2013), with an incidence well below the previous ones (5.22%). Comparing these three studies in a national sample with ours, we found that the incidence of complete metopic suture was close to that of our results, which was 3.6%. Regarding incomplete sutures, two studies mentioned above showed a higher number of cases than ours, while in the third the presence of this type was much lower. Other studies were carried out with foreign samples, aiming to verify the incidence of metopism. On the African continent, a study by Ajmani, Mittal and Jain (1983) was carried out on 206 dried skulls of Nigerian individuals, with complete metopism appearing in 3.4% of the cases, while 34.97% had incomplete metopic sutures. The incidence of complete metopic suture in this study is close to the results of the three studies previously cited in a national sample, including ours. Baaten et al (2003) investigated the incidence of metopism by means of anteroposterior radiographs in 968 adult Lebanese individuals, and of the total only 0.82% had complete metopism, while incomplete sutures had an incidence of 0.93%. Both results are noteworthy because they are very low compared to the studies mentioned above and to ours. With respect to Indian subjects, we selected three studies. Chandrasekaran and Shastri (2010), studied metopism in 160 dried skulls of South Indian adults, complete metopism was found in 5% of cases, while incomplete metopic suture was seen in 40% of skulls. Another study was conducted by Sudhakar et al (2010) with 253 dried skulls from individuals from Central India. In this study, complete metopism appeared in 3.95% of the cases, while incomplete metopic suture was identified in 52.96%. In another study using dried skulls also from individuals from Central India, Sathe and Sathe (2016) observed 70 skulls, of which 2.85% had complete metopism while 4.28% had incomplete sutures. Apparently, the incidence of complete metopic suture in Indian individuals is also close to the studies mentioned above, including in national samples. In another study, carried out on the Asian continent, Khamanarong et al. (2015) used 706 dried skulls of adults belonging to Thai individuals in order to verify the presence of metopism, among these 53 skulls (7.51%) had metopic sutures, 20 skulls with complete metopism (2.83%) and 33 (4.67%) with incomplete metopism. In this case, we also found a low incidence of incomplete metopism. This is another study in which the frequency of complete metopic suturing was close to the studies mentioned above and also when compared to ours.

4 CONCLUSION

Due to the large territorial extension of Brazil and the great miscegenation of the population, in our opinion it is necessary to carry out more studies on Brazilian individuals, by means of dried skulls or images, especially if carried out in different regions of our country. Knowledge of the metopic suture and its variations according to ethnicity becomes important in clinical medicine, thus avoiding misdiagnoses, in addition to being important in human identification in forensic anthropological expertise.

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